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Recent records of the Star-throated Antwren, *Rhopias gularis* (Spix, 1825) (Aves, Thamnophilidae), in Rio Grande do Sul, southern Brazil

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Abstract
For over 130 years, the Atlantic Forest antwren *Rhopias gularis* (Spix, 1825) remained known in the Brazilian state of Rio Grande do Sul from 2 undated specimens collected by Hermann von Ihering at Taquara in the early 1880s. We located 1 couple plus 2 lone females along the border with Santa Catarina in the Josafaz stream valley, municipality of Mampituba, in October 2017 and January 2018. These records confirm the present-day occurrence of *R. gularis* in Rio Grande do Sul and establish a new southern limit of its distribution. We briefly discuss the validity of Ihering's record and the historical occurrence of the species at Taquara.

Key words
Atlantic Forest; distribution; rediscovery; Ihering; *Myrmotherula gularis*.

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Introduction

Long placed in the highly species-rich Neotropical genus *Myrmotherula* Sclater, 1858, the Star-throated Antwren was recently transferred to the monotypic genus *Rhopias* Cabanis & Heine, 1860 on account of its phylogenetic and morphological distinctiveness among the Thamnophilidae (Belmonte-Lopes et al. 2012). This small antbird (total length 8.5–9.5 cm; weight 10–12 g) is endemic to the Atlantic Forest of southeastern and southern Brazil, ranging from southern Bahia to northeastern Rio Grande do Sul (Zimmer et al. 2018). Within this restricted range (sensu Stattersfield et al. 1998), it frequents the understory and lower growth of lowland and montane evergreen forest, from sea level to about 1,550 m, often preferring shady ravines and stream edges (Ridgely and Tudor 1994, Parker et al. 1996, Sick 1997).

At the southern limit of its historical range, the Star-throated Antwren has been known from only 2 specimens obtained in the 19th century by the German naturalist Hermann von Ihering at Taquara (29°40′ S, 050°47′ W), in the middle reaches of the Sinos river basin in northeastern Rio Grande do Sul (Belton 1994). The exact date of collection of these specimens is unknown, but they were undoubtedly obtained sometime between 1880 and 1883, when Ihering lived at Taquara, and most probably between June 1882 and December 1883, when he actively collected birds at this locality and its vicinity (Berlepsch and Ihering 1885, Voss 1974).

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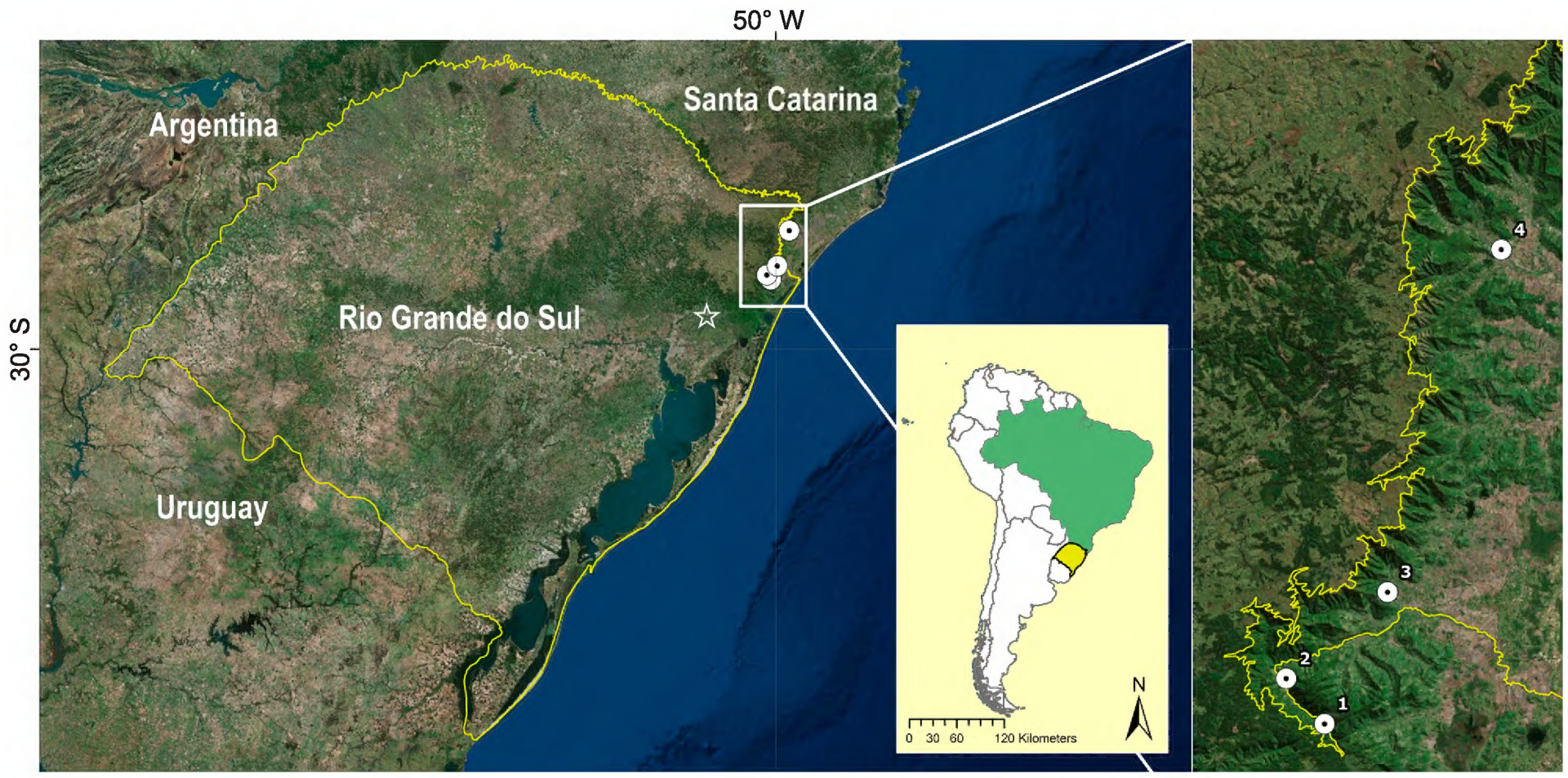

Figure 1. Localities of historical (star) and recent records of the Star-throated Antwren, *Rhopias gularis,* in Rio Grande do Sul and adjacent Santa Catarina, southern Brazil. The inset shows in more detail locations of records on the Serra Geral slopes across the Rio Grande do Sul–Santa Catarina border. 1. Josafaz Canyon, municipality of Mampituba, Rio Grande do Sul (this study). 2. Mouth of the Josafaz stream valley below the Pedra Branca outcrop, municipality of Mampituba, Rio Grande do Sul (this study). 3. Serra do Faxinal, Praia Grande, Santa Catarina (Lia N. Kajiki, XC308466). 4. Timbé do Sul, Santa Catarina (Just et al. 2015). Satellite images from Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN and the GIS User Community.

Ihering's specimens of *Rhopias gularis* are reported to have been sent in alcohol to Count Hans von Berlepsch (Berlepsch and Ihering 1885), whose private collection was acquired by the Senckenberg Museum in Frankfurt, Germany after his death (Palmer 1928). However, these specimens are no longer in the collections of that museum (G. Mayr, in litt. 2018) and their fate or current location is unknown, although most of the contemporaneous specimens of Ihering are still preserved there (Bencke 2001).

Here, we report recent field observations documenting the present-day occurrence of *R. gularis* in the state of Rio Grande do Sul (hereafter RGS) and establishing a new southern limit for its current known distribution.

Methods

Records were made at 2 closely-spaced localities in the municipality of Mampituba, in the extreme northeast of the state (Fig. 1). Fieldwork took place in the valley of the Josafaz stream, which is a tributary of the upper Mampituba River bordering the states of RGS and Santa Catarina. AB worked near the mouth of the valley below the Pedra Branca outcrop on 24–26 October 2017. GB, EC, WH and MM surveyed birds upstream around 29°19′04″ S, 050°03′25″ W, where the valley narrows into a deep canyon, on 24–26 January 2018.

About 12 km long, the Josafaz Canyon (Fig. 2) dissects the abrupt escarpment (Serra Geral) that makes the transition between the littoral and the highlands of the southern Brazilian plateau (Planalto). Submontane and montane evergreen forests cover the canyon bottom and walls for most of its length, while *Araucaria*-dominated

Figure 2. Josafaz Canyon, looking downstream from near its midpoint, on the border between Rio Grande do Sul and Santa Catarina, southern Brazil. Photograph by Walter Hasenack.

forests border the canyon's rim above approximately 850 m and gradually turn into upland grasslands toward the flatter areas of the Planalto. The vegetation, much modified by man in the lower portion of the valley, becomes less disturbed as one moves towards the bottom and is characteristic of the Atlantic Forest in the middle and upper parts of the canyon, where vestiges of the human presence are few.

Results

New records. Brazil: Rio Grande do Sul state: near mouth of the Josafaz stream valley (29°16′17.5″ S, 050°06′07″ W; 370 m above sea level [a.s.l.]), Serra Geral, municipality of Mampituba; a couple observed for about 25 min by AB in the morning of 25 October 2017 (Fig. 3 and

Figure 3. Male Star-throated Antwren *Rhopias gularis* photographed on 25 October 2017 near the mouth of the Josafaz stream valley, municipality of Mampituba, in northeastern Rio Grande do Sul. Photograph by Alexandre Bianco.

Figure 4. Female Star-throated Antwren *Rhopias gularis* photographed on 26 January 2018 at Josafaz Canyon, municipality of Mampituba, in northeastern Rio Grande do Sul. Photograph by Paulo Fenalti.

audio recordings available at Xeno-canto, https://www.xeno-canto.org as XC398871–XC398874).

The birds, first detected by voice and subsequently attracted with playback, remained within c. 20 m of a streamlet in a heavily shaded tract of submontane forest in fairly good condition. The male reacted rather aggressively and exhibited its white interscapular patch, while the female kept some distance from the observer. The male was photographed (Fig. 3) and later both birds had their voices recorded.

Brazil: Rio Grande do Sul state: Josafaz Canyon (site 1: 29°19′11″S, 050°03′15″W, c. 400 m a.s.l.; site 2: 29°19′04″S, 050°03′25″W, 370 m a.s.l.), Serra Geral, municipality of Mampituba; 2 females observed (1 at each site) by GB, EC, WH, MM and Paulo Fenalti on 25 and 26 January 2018 (Fig. 4).

We found these birds at 2 points along the right (north) side of the upper Josafaz stream, c. 8 km upriver and much deeper into the canyon compared to the previous record. Both were detected with the aid of playback, showing a strong territorial reaction. The first one was located early in the morning and again in the late afternoon of the 25th (site 1), while the second bird was found the next morning about 350 m downriver around the researchers' camp (site 2). The birds moved around alone and remained within 50 m of the stream bank, singing and calling repeatedly in response to playback. On the 26th, we were able to follow the latter individual (Fig. 4) for nearly 1 hour, during which time it occupied an area of about 700 square meters, hopping at ground level on fallen trunks or among the bases of leaves of terrestrial ferns, and also clinging to vertical stems or perching on slender horizontal branches up to 1.5 m above ground. Vegetation at both sites is tall, lightly disturbed evergreen forest with a relatively open understory dominated by ferns and saplings (Fig. 5). In this section of the canyon, the riparian zone is very narrow and the gently sloping to moderately rugged relief of the bottom quickly gives way to very steep slopes that rise almost vertically up to about 1,000 m of altitude. Searches using playback in highly disturbed and secondary forests up to 6 km downriver along the Josafaz stream failed to reveal additional individuals.

Identification. On all occasions, species identification was based on voice and plumage characters. The distinctive song, a slightly descending series of 8 or 9 harsh notes that gradually increases in volume in the first 4 notes, is somewhat reminiscent of that of the sympatric

Figure 5. Dense, little-disturbed evergreen forest inhabited by the Star-throated Antwren *Rhopias gularis* in the most remote parts of the Josafaz Canyon, along the Rio Grande do Sul–Santa Catarina border. Photograph by Walter Hasenack.

Black-billed Scythebill, *Campylorhamphus falcularius* (Vieillot, 1822), though noticeably faster, weaker and higher-pitched. The scold or disturbance call—a loud, screechy *chee-chee-cheek*, with up to 4 similar notes—can be easily mistaken for that of the syntopic Sharp-tailed Streamcreeper, *Lochmias nematura* (Lichtenstein, 1823), which makes it less reliable as an identification clue, especially when heard from a distance. The extensively brownish upperparts, gray breast and belly, black wing-coverts conspicuously dotted with buff and black throat spotted white are distinctive plumage characters noted in the field, which in combination with the small body size and very short tail eliminate any other potentially syntopic species (Ridgely et al. 2015).

Discussion

In recent years, the Star-throated Antwren was previously known to occur south to Timbé do Sul (28°50′ S, 049°51′ W; Just et al. [2015]) and Serra do Faxinal, Praia Grande (29°11′ S, 049°59′ W; sound recording by Lia N. Kajiki, XC308466) in adjacent southeastern Santa Catarina, just 50 km and 15 km north of our sites, respectively. Therefore, our records extend the known range of the species slightly further southward and set the Josafaz Canyon as a new southern limit for its current distribution.

Ihering's late 19th-century collections from Taquara are the only previous evidence that the Star-throated Antwren once occurred in RGS (Belton 1994). However, the only 2 specimens he collected there have since been lost or disappeared and their identity can no longer be verified. Notwithstanding, Ihering's record has never been questioned and was accepted by the authors of all subsequent ornithological catalogues and survey reports covering RGS (e.g., Cory and Hellmayr 1924, Naumburg 1937, Meyer de Schauensee 1970, Pinto 1978, Belton 1985, 1994, Bencke 2001). Furthermore, in briefly commenting on the small assemblage of essentially coastal Atlantic Forest endemics encountered by Ihering in the vicinity of Taquara, Bencke et al. (2010) stated that the former presence of such species so far inland, albeit seemingly inconsistent with their current distribution patterns when analyzed independently, shows a certain degree of biogeographical coherence when considered in conjunction. Besides the Star-throated Antwren, this assemblage included several other species now presumed to be extinct in the southern Serra Geral escarpment around Taquara (Bencke et al. 2003) and found today only from the lowland coastal forests of the northeastern littoral of the state northwards into the Atlantic Forest domain, e.g., Squamate Antbird *Myrmoderus squamosus* (Pelzeln, 1868) and White-breasted Tapaculo *Eleoscytalopus indigoticus* (Wied, 1831).

In light of these considerations, the historical occurrence of the Star-throated Antwren 80 km southwest of the Josafaz Canyon at Taquara seems plausible and we can only speculate about the reasons for its probable extinction there. The lower slopes of the Serra Geral escarpment and adjacent river plains in the northeastern quarter of RGS experienced extensive deforestation after the settlement of European immigrants from 1824 onwards. This certainly reduced habitat connectivity, potentially resulting in the local extinction of northerly species with poor dispersal ability (see Moore et al. 2008) and dependent on little disturbed forests, such as the Star-throated Antwren.

We can further speculate that the Star-throated Antwren spread beyond its present limits sometime during the late Holocene, following a pulse of southward expansion of the floristic contingent associated with the broadleaf evergreen forest, and subsequently underwent a retreat toward its current distribution. This secondary retreat in response to an adverse climatic shift might eventually have resulted in the species surviving in refuges or being locally extinct near the southern boundary of its range. In line with this hypothesis, it has been demonstrated that climatic fluctuations in the late Quaternary significantly affected vegetational dynamics in southern Brazil (see Rodrigues et al. 2016 and references therein). Today, several plant species associated with distinct floras show disjunct populations in southern Brazil (Klein 1975). Such population isolates have long been interpreted as geographical relicts of formerly larger distributional areas (Klein 1984), like footprints left in the way of past biogeographic advances. This could help explain the isolated and rather unexpected occurrence of the Star-throated Antwren in the Sinos river basin at the time of Ihering. The disjunct occurrences of the Plain Parakeet *Brotogeris tirica* (Gmelin, 1788), Gray-capped Tyrannulet *Phyllomyias griseocapilla* Sclater, 1862, and Olive-green Tanager *Orthogonys chloricterus* (Vieillot, 1819) in the Maquiné river valley (Bencke 2010), also in northeastern RGS, possibly constitute modern examples of the same pattern of relictual distribution in which sheltered valleys may have provided refuges where some northerly species managed to survive up to the present after climate-induced biogeographic retreats in the late Quaternary.

Whatever the circumstances surrounding the historical occupation of the southern escarpment by the species, our photographic and sound records demonstrate the contemporary occurrence of the Star-throated Antwren in RGS and currently provide the only physical evidence of its presence in the state. The finding of this species in RGS after more than 130 years of obscurity follows the recent rediscovery of 2 other Atlantic Forest birds collected by Ihering around Taquara in the late 1800s and which likewise remained unrecorded in the state for more than a century, namely the Brazilian Ruby, *Heliodoxa rubricauda* (Boddaert, 1783), and the Buffy-fronted Seedeater, *Sporophila frontalis* (Verreaux, 1869). Both were recently found in the northeast of RGS (Bencke et al. 2017, Just et al. 2017). Of these species, only the latter has been formally listed as extinct in RGS (Bencke et al. 2003, FZB 2014). The Brazilian Ruby and the Star-throated Antwren, on the other hand, have so far been

considered ineligible for assessment of extinction risk at the regional level, because of the uncertainties concerning their past status in RGS and the availability of documentary evidence (Bencke et al. 2003, FZB 2014).

Finally, additional records may reveal that the Star-throated Antwren is expanding southward along the densely forested Serra Geral slopes across the RGS–Santa Catarina border, as recently suggested for other Atlantic Forest birds (Bencke et al. 2017, Just et al. 2017). Consistent with a range expansion or recolonization hypothesis, records of the Star-throated Antwren in this region are recent (post-2012; Just et al. 2015; see also Bege and Marterer 1991, Rosário 1996), but undersampling cannot be presently ruled out as another explanation for the lack of old records, especially in view of the scarcity of historical ornithological surveys in this part of the Atlantic Forest. In any case, opportunities for further southward expansion seem limited for species poorly adapted for dispersal over open areas like the Star-throated Antwren, because of the extensive clearance and fragmentation of native forests along the foot of the Serra Geral escarpment and in adjacent lowlands.

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Authors' Contributions

All the authors contributed field records, GAB wrote the manuscript, and EC, AB and WH made additions and suggestions.

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